

# CLAIMS

What is Claimed is:

1. A method for forming via or contact holes with improved aspect ratios by using deep UV photoresist comprising the steps of:

providing a pre-processed semiconductor substrate;

depositing a Si-containing etch stop layer on top of said substrate;

depositing an oxide layer on said etch stop layer;

depositing a deep UV photoresist on top of said oxide layer;

curing said deep UV photoresist with UV radiation for at least 1 minute;

defining openings for said via or contact; and

etching said openings forming said via or contact holes.

2. A method for forming via or contact holes with improved aspect ratios by using deep UV photoresist according to claim 1 further comprising the step of etching said openings to form via or contact holes having an aspect ratio of at least 8.

3. A method for forming via or contact holes with improved aspect ratios by using deep UV photoresist according to claim 1 further comprising the step of depositing said Si-containing etch stop

layer with a material selected from the group consisting of  $\text{Si}_3\text{N}_4$ ,  $\text{SiON}$  and  $\text{SiC}$ .

4. A method for forming via or contact holes with improved aspect ratios by using deep UV photoresist according to claim 1, wherein said oxide layer deposited is an inter-level-dielectric (ILD) layer.

5. A method for forming via or contact holes with improved aspect ratios by using deep UV photoresist according to claim 1 further comprising the step of curing said deep UV photoresist with UV radiation for a time period between about 1 minute and about 10 minutes.

6. A method for forming via or contact holes with improved aspect ratios by using deep UV photoresist according to claim 1 further comprising the step of curing said deep UV photoresist with UV radiation for a time period between about 1 minute and about 10 minutes at a temperature of at least  $100^\circ\text{C}$ .

7. A method for forming via or contact holes with improved aspect ratios by using deep UV photoresist according to claim 1 further

comprising the step of reducing fluorocarbon polymer formation from said deep UV photoresist by curing with UV radiation.

8. A method for forming via or contact holes with improved aspect ratios by using deep UV photoresist according to claim 1 further comprising the step of removing said Si-containing etch-stop layer.

9. A method for forming a large aspect ratio hole in an insulating material layer on a semi-conducting substrate comprising the steps of:

providing a pre-processed semi-conducting substrate having an etch-stop layer deposited on top;

depositing an insulating material layer on said etch-stop layer;

forming a deep UV photoresist layer on top of said insulating material layer;

irradiating said deep UV photoresist layer with UV radiation for at least 1 minute;

etching a hole having an aspect ratio of larger than 8 in said insulating material layer by using said deep UV photoresist layer; and

removing said etch-stop layer in said etched hole.

10. A method for forming a large aspect ratio hole in an insulating material layer on a semi-conducting substrate according to claim 9 further comprising the step of forming the hole with an aspect ratio between about 8 and about 20.

11. A method for forming a large aspect ratio hole in an insulating material layer on a semi-conducting substrate according to claim 9 further comprising the step of depositing said insulating material layer with an inter-level-dielectric (ILD) material.

12. A method for forming a large aspect ratio hole in an insulating material layer on a semi-conducting substrate according to claim 9 further comprising the step of depositing said insulating material layer.

13. A method for forming a large aspect ratio hole in an insulating material layer on a semi-conducting substrate according to claim 9 further comprising the step of depositing said etch-stop layer by a material selected from the group consisting of  $\text{Si}_3\text{N}_4$ ,  $\text{SiON}$  and  $\text{SiC}$ .

14. A method for forming a large aspect ratio hole in an insulating material layer on a semi-conducting substrate according to claim 9 further comprising the step of irradiating said deep UV photoresist layer with UV radiation for a time period between about 1 minute and about 10 minutes.

15. A method for forming a large aspect ratio hole in an insulating material layer on a semi-conducting substrate according to claim 9 further comprising the step of etching said hole for forming a via or a contact.